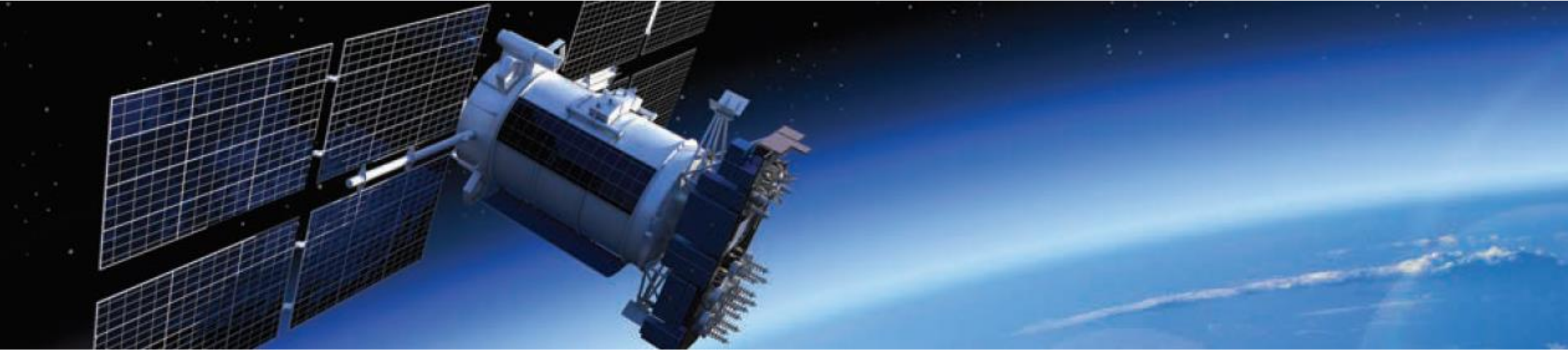


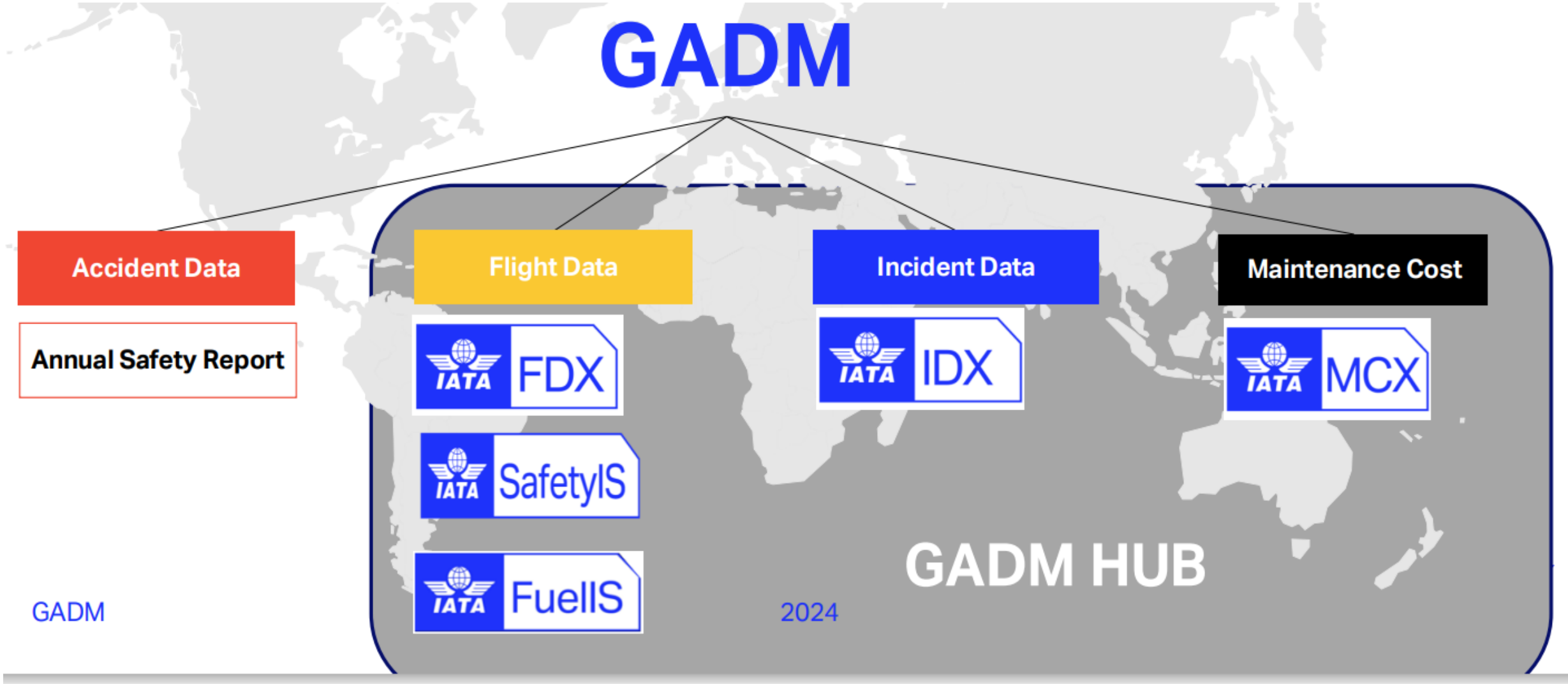
PBN SG/9 Meeting

GNSS Radio Interference Incidents

Doha, Qatar 09-11 December 2024

Jehad Faqir
Head of Regional Safety Africa & Middle East
IATA

Global Aviation Data Management



What is FDX?

Objective: **to mitigate safety risks and improve flight efficiency**

- **Global aggregate de-identified program** using FDA data to help airlines identify safety trends
- Allows the airline to look at data **beyond their limited airline dataset**
- Airlines use **benchmarking tool** to compare safety performance and issues against global and regional safety trends
- Not a FOQA program
- Allows airlines to query information and compare performance using a web-based platform
- Supports airlines through providing in-depth analyses when required

FDx How does it work?

Airline A

Airline B

Raw data from the aircraft is downloaded routinely for FOQA/FDM/FDA

In FDX, airlines submit flight data to IATA* where it is processed using a common event set,

de-identified results are integrated into a database with inputs from multiple operators,

to generate global trends, rates and training materials and to support advocacy work

(*) IATA works with Flight Data Services as its collaborative partner for FDX data processing. Data is displayed only when there are at least 3 operators with the same aircraft type. De-identification includes: no airline information is available, the tail numbers and the flight numbers are written off, the flight date is set to the first day of the month.

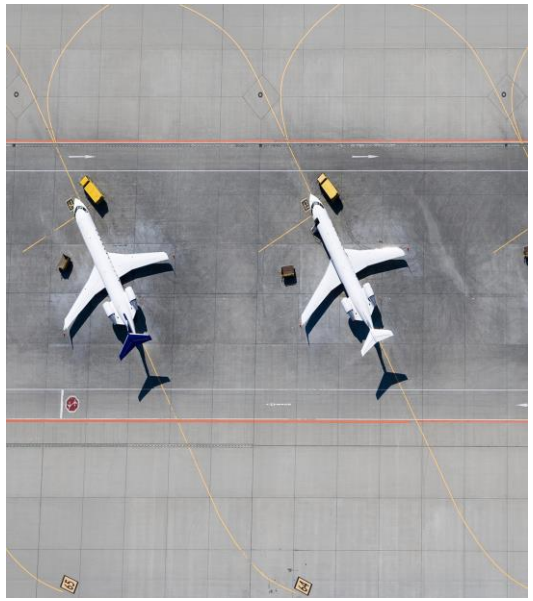
FDX Statistics

More than
213
Airlines and
growing

More than
18 000 000
flights globally

More than
8000
aircraft

IDX Statistics



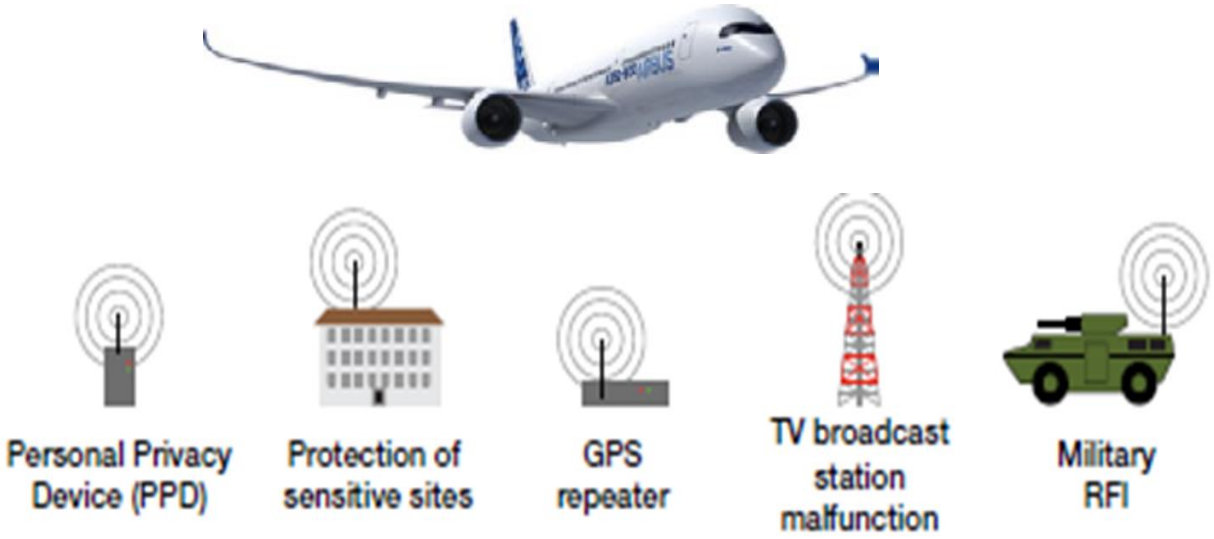
289
Airlines
Participants
and growing

IATA

GNSS Background

- The GPS signal is a low power signal. It is comparable to the **power emitted by a 60W light-bulb** located more than **20,000 km away** from the surface of the earth.
- GPS L1 frequency band (**1575.42 MHz +/-10 MHz)**

- **Main known sources of RFI**



- **GNSS spoofing**

Some of the known RFI sources are reportedly capable of emitting signals that **mimic GNSS signals**

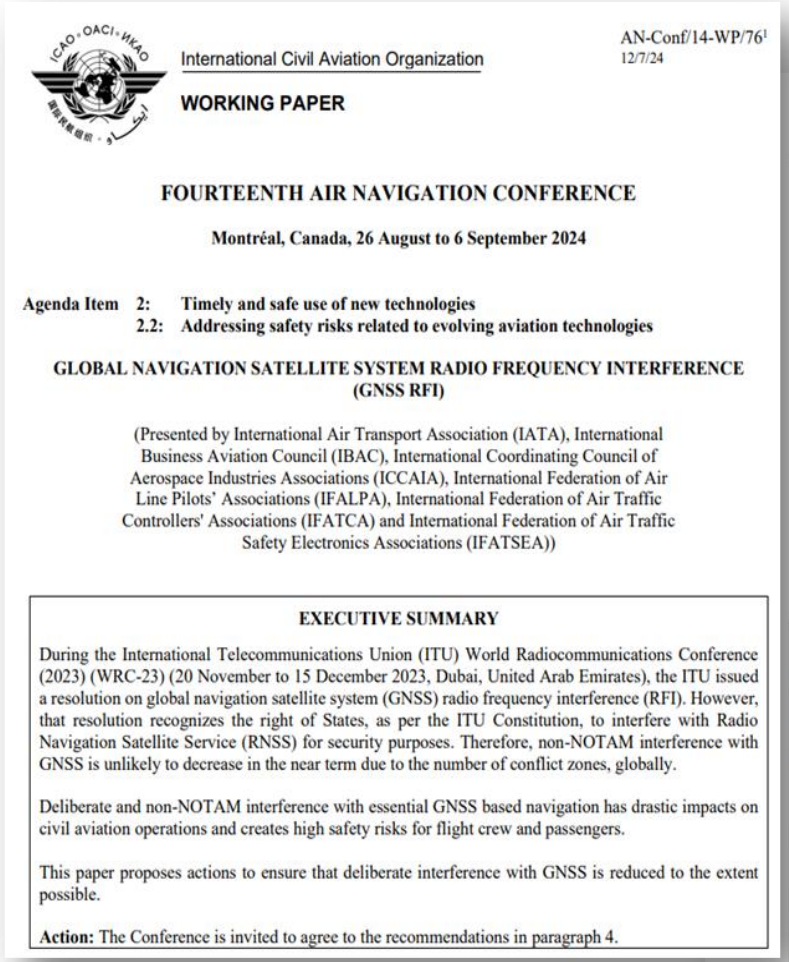
GNSS disruptions often emanate from conflict zones or areas of heightened tensions,
Occur in conjunction with military operations and/or Military force Protection measures,

- Counter-unmanned aircraft systems (C-UAS) measures,
- Protection of senior leadership
- Protection of critical infrastructure
- countermeasures against GPS guided offensive weapons

GNSS RFI – AN Conf Outcomes

7

2 IATA WPs
2 European Union
Republic of Korea
Singapore
Cameroon



International Civil Aviation Organization

AN-Conf/14-WP/76[1]
12/7/24

WORKING PAPER

FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 2: Timely and safe use of new technologies
2.2: Addressing safety risks related to evolving aviation technologies

GLOBAL NAVIGATION SATELLITE SYSTEM RADIO FREQUENCY INTERFERENCE (GNSS RFI)

(Presented by International Air Transport Association (IATA), International Business Aviation Council (IBAC), International Coordinating Council of Aerospace Industries Associations (ICCAIA), International Federation of Air Line Pilots' Associations (IFALPA), International Federation of Air Traffic Controllers' Associations (IFATCA) and International Federation of Air Traffic Safety Electronics Associations (IFATSEA))

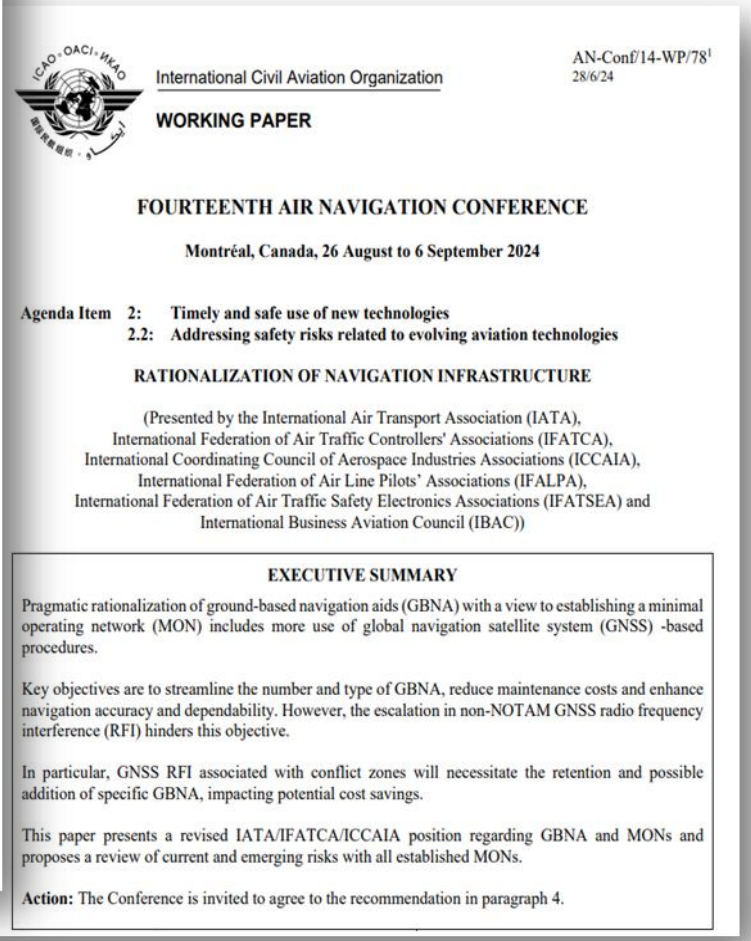
EXECUTIVE SUMMARY

During the International Telecommunications Union (ITU) World Radiocommunications Conference (2023) (WRC-23) (20 November to 15 December 2023, Dubai, United Arab Emirates), the ITU issued a resolution on global navigation satellite system (GNSS) radio frequency interference (RFI). However, that resolution recognizes the right of States, as per the ITU Constitution, to interfere with Radio Navigation Satellite Service (RNSS) for security purposes. Therefore, non-NOTAM interference with GNSS is unlikely to decrease in the near term due to the number of conflict zones, globally.

Deliberate and non-NOTAM interference with essential GNSS based navigation has drastic impacts on civil aviation operations and creates high safety risks for flight crew and passengers.

This paper proposes actions to ensure that deliberate interference with GNSS is reduced to the extent possible.

Action: The Conference is invited to agree to the recommendations in paragraph 4.



International Civil Aviation Organization

AN-Conf/14-WP/78[1]
28/6/24

WORKING PAPER

FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 2: Timely and safe use of new technologies
2.2: Addressing safety risks related to evolving aviation technologies

RATIONALIZATION OF NAVIGATION INFRASTRUCTURE

(Presented by the International Air Transport Association (IATA), International Federation of Air Traffic Controllers' Associations (IFATCA), International Coordinating Council of Aerospace Industries Associations (ICCAIA), International Federation of Air Line Pilots' Associations (IFALPA), International Federation of Air Traffic Safety Electronics Associations (IFATSEA) and International Business Aviation Council (IBAC))

EXECUTIVE SUMMARY

Pragmatic rationalization of ground-based navigation aids (GBNA) with a view to establishing a minimal operating network (MON) includes more use of global navigation satellite system (GNSS) -based procedures.

Key objectives are to streamline the number and type of GBNA, reduce maintenance costs and enhance navigation accuracy and dependability. However, the escalation in non-NOTAM GNSS radio frequency interference (RFI) hinders this objective.

In particular, GNSS RFI associated with conflict zones will necessitate the retention and possible addition of specific GBNA, impacting potential cost savings.

This paper presents a revised IATA/IFATCA/ICCAIA position regarding GBNA and MONs and proposes a review of current and emerging risks with all established MONs.

Action: The Conference is invited to agree to the recommendation in paragraph 4.

GNSS RFI – AN Conf Outcomes

Recommendation 2.2/2 – Addressing global navigation satellite system interference and contingency planning

Draft Report

That States:

a) ensure that effective global navigation satellite system radio frequency interference mitigation measures are implemented, based on measures developed by ICAO and industry, including the need to maintain a sufficient network of conventional navigation aids to ensure operational safety as well as sufficient airspace capacity during times of GNSS interference;

b) through the mechanism of the planning and implementation regional groups, develop regional or global navigation satellite system reporting mechanisms, as described in the *Global Navigation Satellite System (GNSS) Manual* (Doc 9849); and

c) work with industry to provide guidance on detecting global navigation satellite system jamming or spoofing and maintaining safe and efficient aircraft operation in case of global navigation satellite system anomalies;

that ICAO:

d) develop a standardized implementation package to assist and guide States in implementing effective global navigation satellite system radio frequency interference mitigation measures, including optimization and rationalization of conventional navigation aids, commensurate with their local conditions, to ensure continuity in the provision of air navigation services;

e) develop guidance on civil-military coordination in relation to harmful interference to global navigation satellite system(s) originated or detected by military authorities; and

f) review aircraft minimum equipage lists to ensure compatibility with States' implemented minimum operational networks.

Analysis Scope – Geographic Scope

List of FIRs (Flight Information Regions)
In alphabetical order of FIR Code

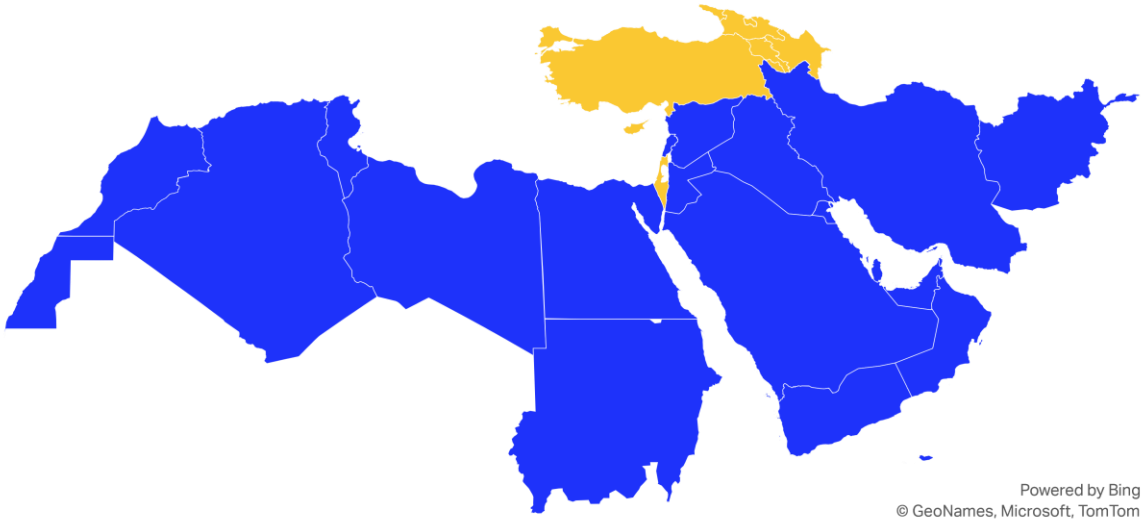
DAAA	Algeria	OIIX	Iran, Islamic Republic of
DTTC	Tunisia	OJAC	Jordan
GMMM	Morocco	OKAC	Kuwait
HECC	Egypt	OLBB	Lebanon
HLLL	Libya	OMAE	United Arab Emirates
HSSS	Sudan	OOMM	Oman
LTAA	Turkiye	ORBB	Iraq
LTBB	Turkiye	OSTT	Syrian Arab Republic
OAKX	Afghanistan	OTDF	Qatar
OBBB	Bahrain	OYSC	Yemen, Republic of
OEJD	Saudi Arabia		

IATA MENA States:

Afghanistan, Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, UAE, Yemen

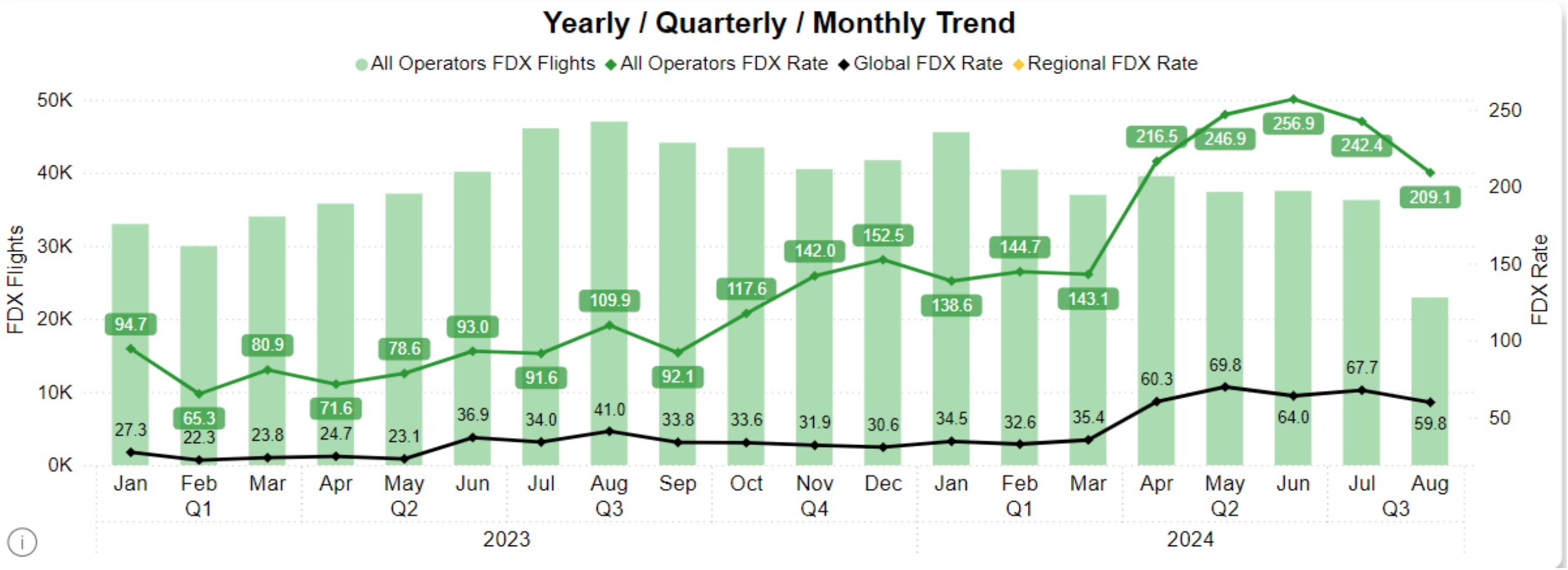
Adjacent States included in this analysis:

Türkiye

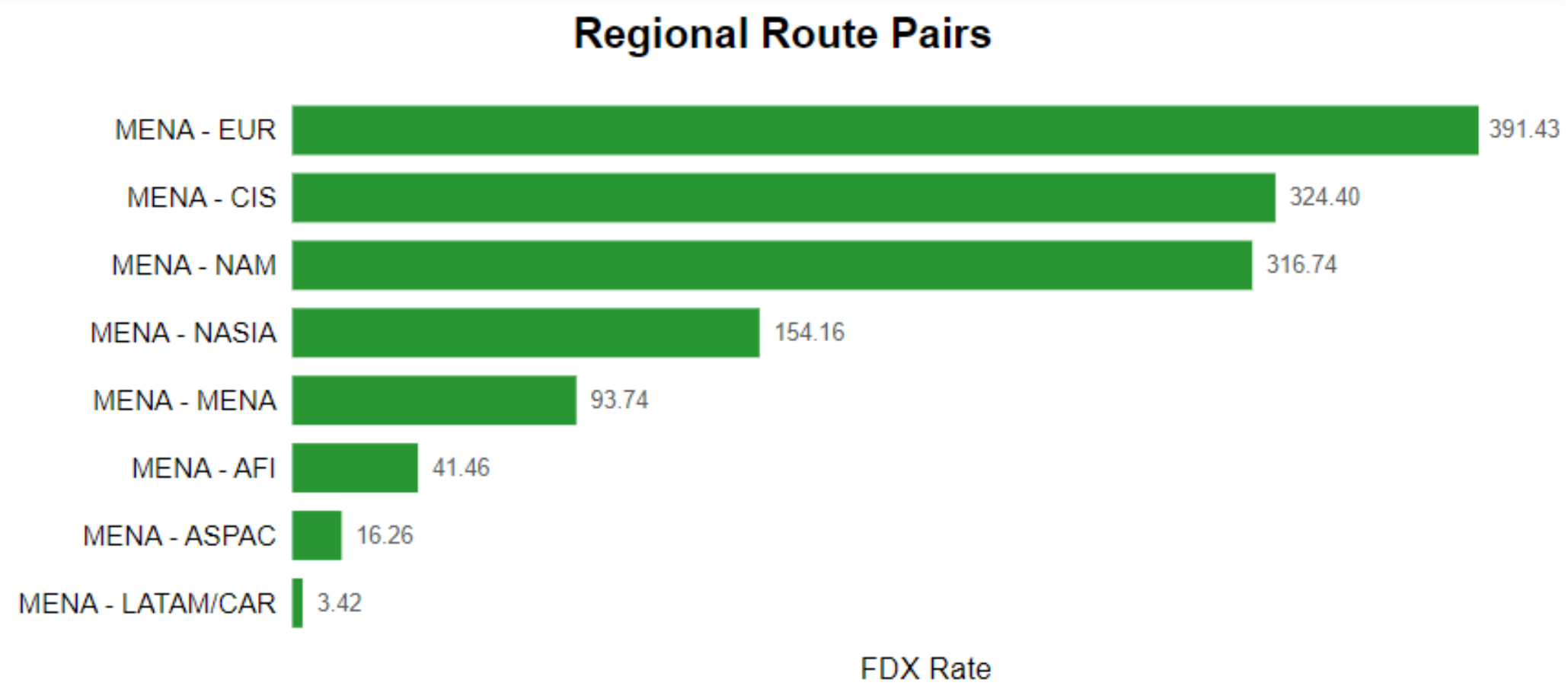


GNSS RFI In Flight MENA

All Operators FDX Rate	Global FDX Rate
138.00	39.38

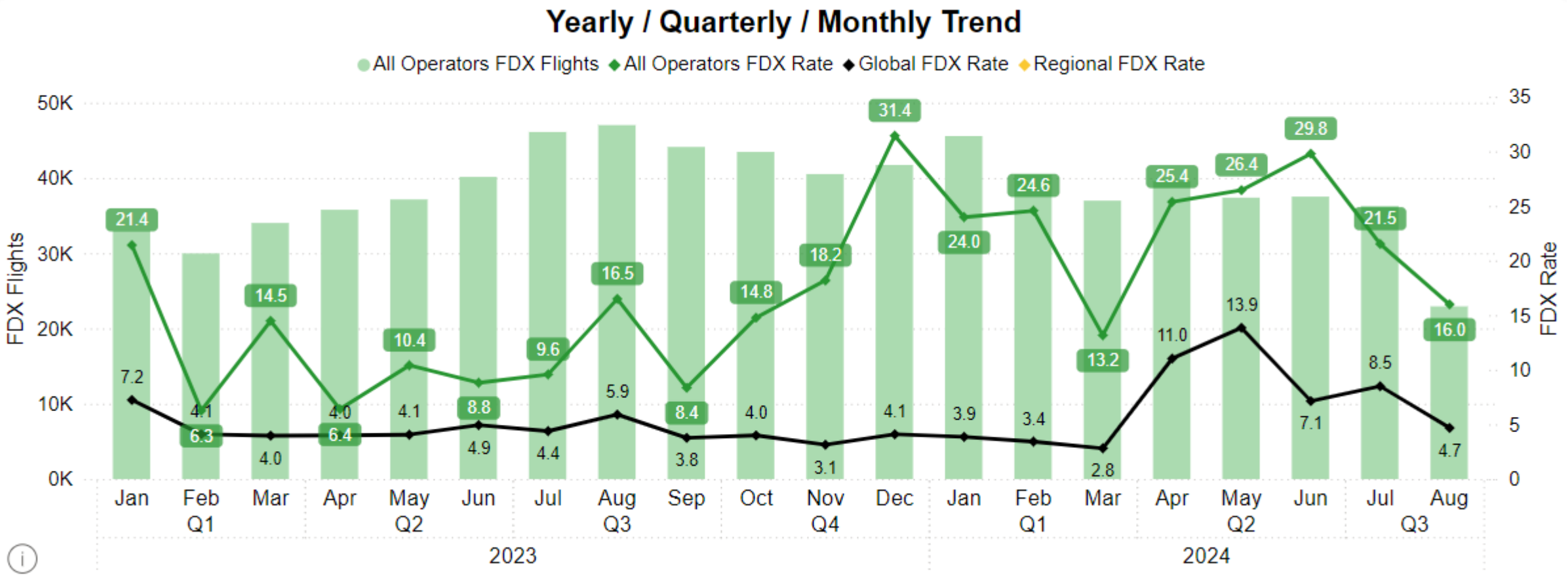


Location Trend

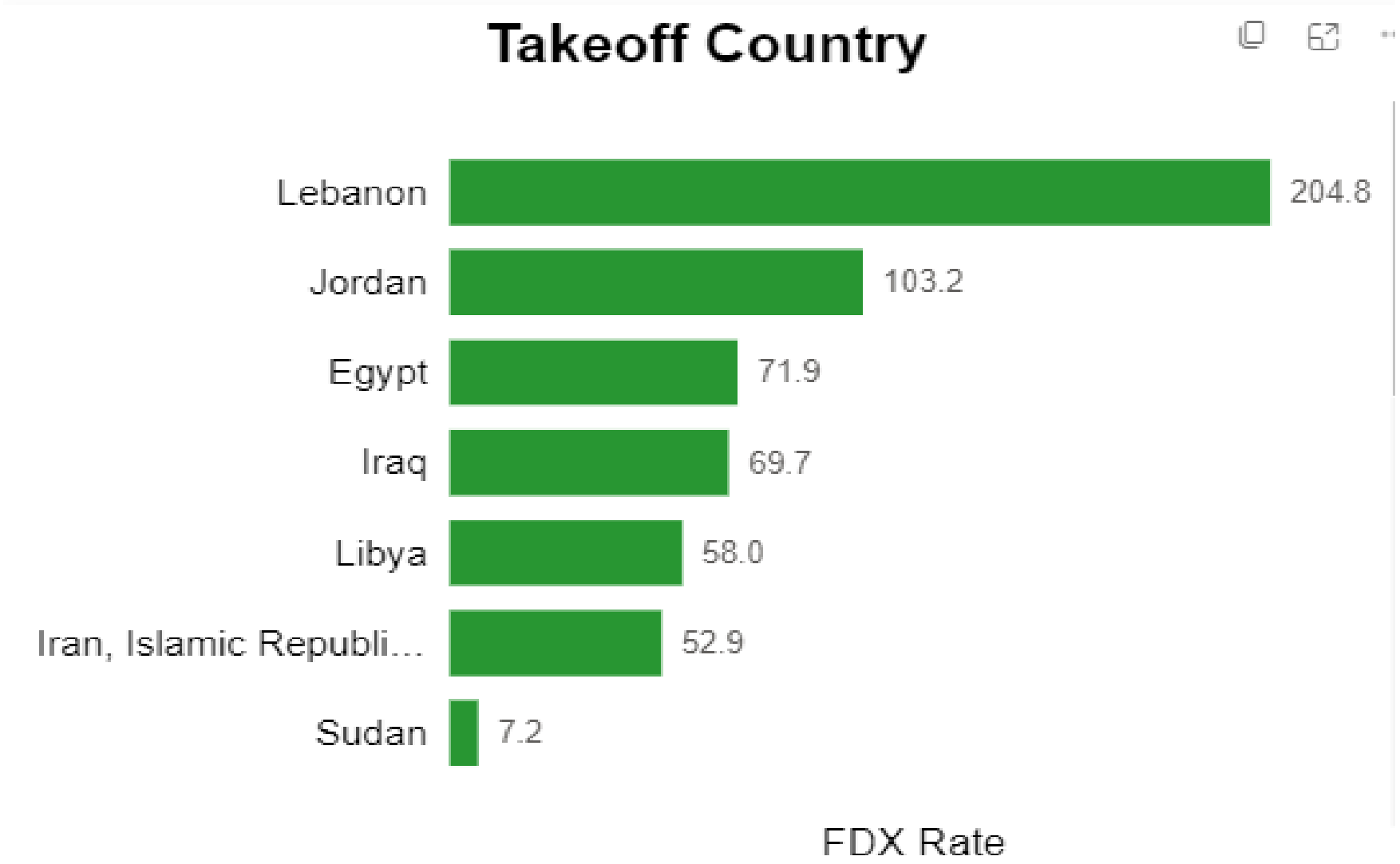


GNSS RFI Takeoff and Climb MENA

All Operators FDX Rate	Global FDX Rate
17.49	5.49

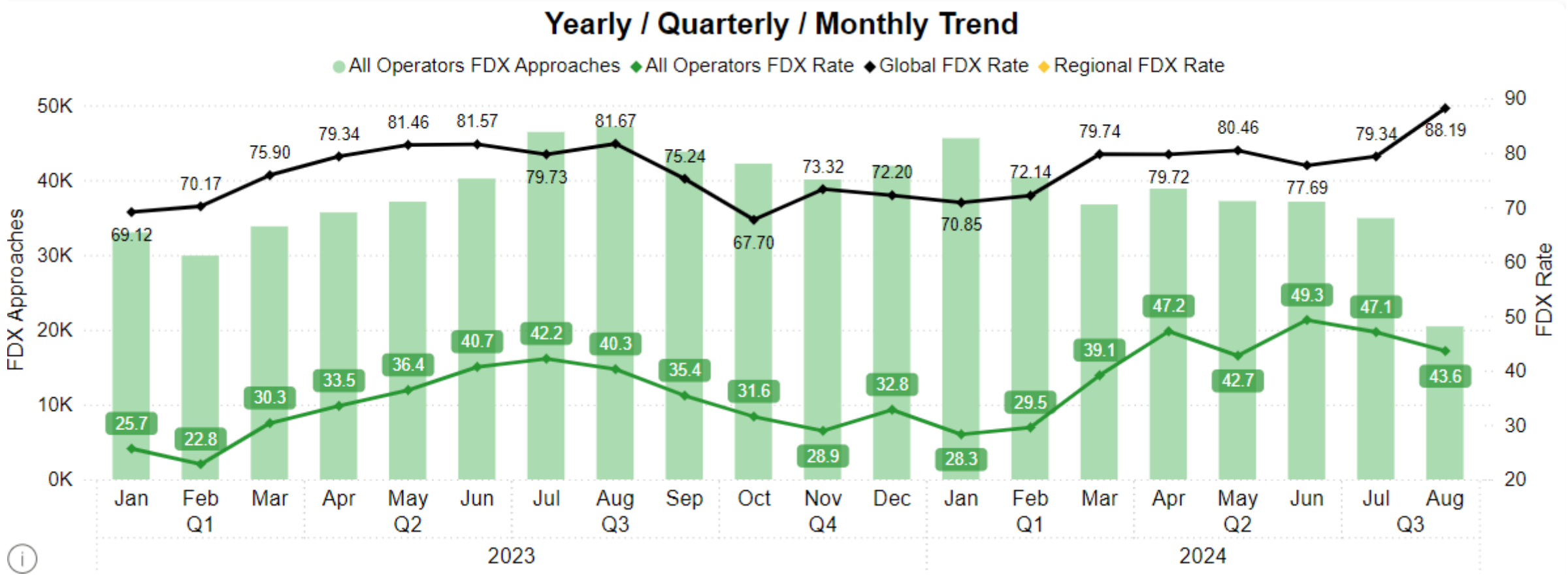


Location Trend



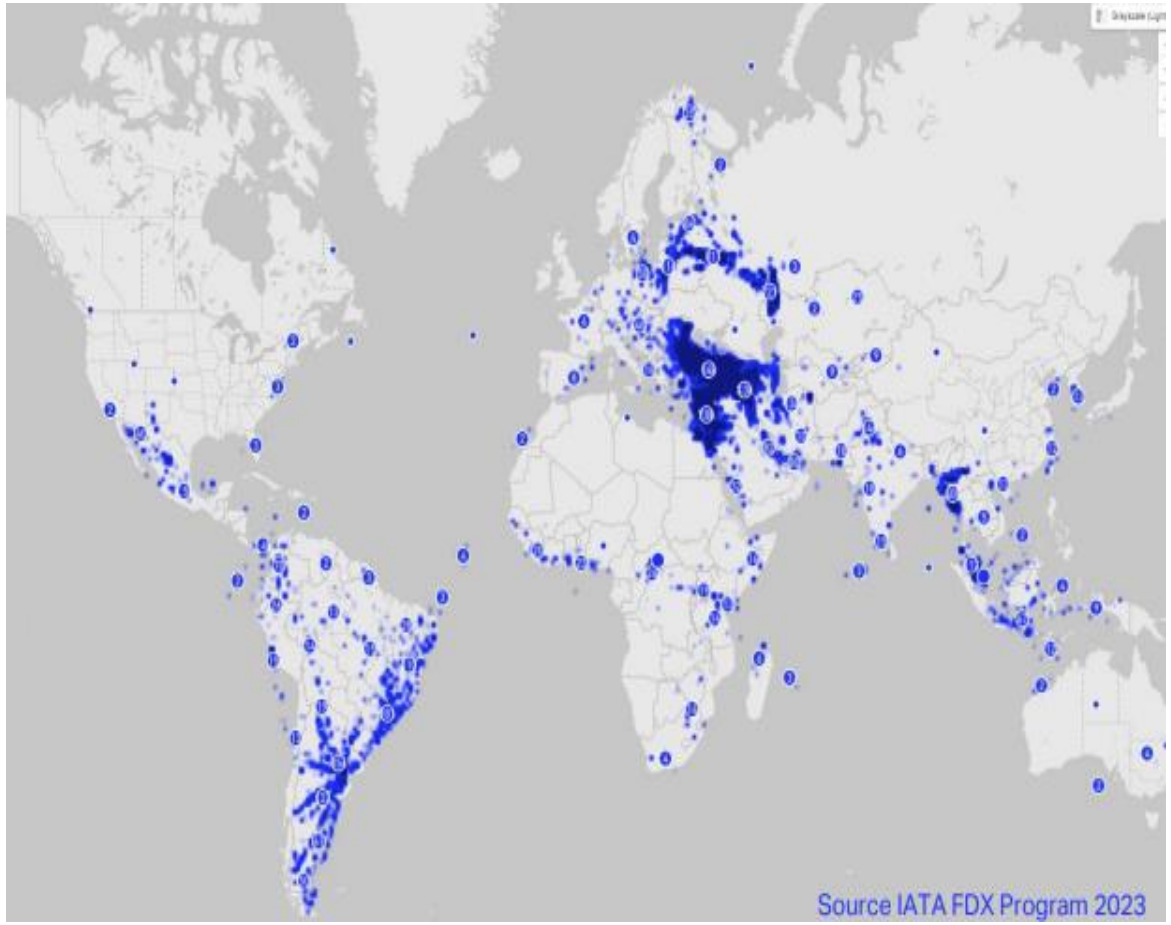
GNSS RFI Approach MENA

All Operators FDX Rate	Global FDX Rate
36.35	76.65

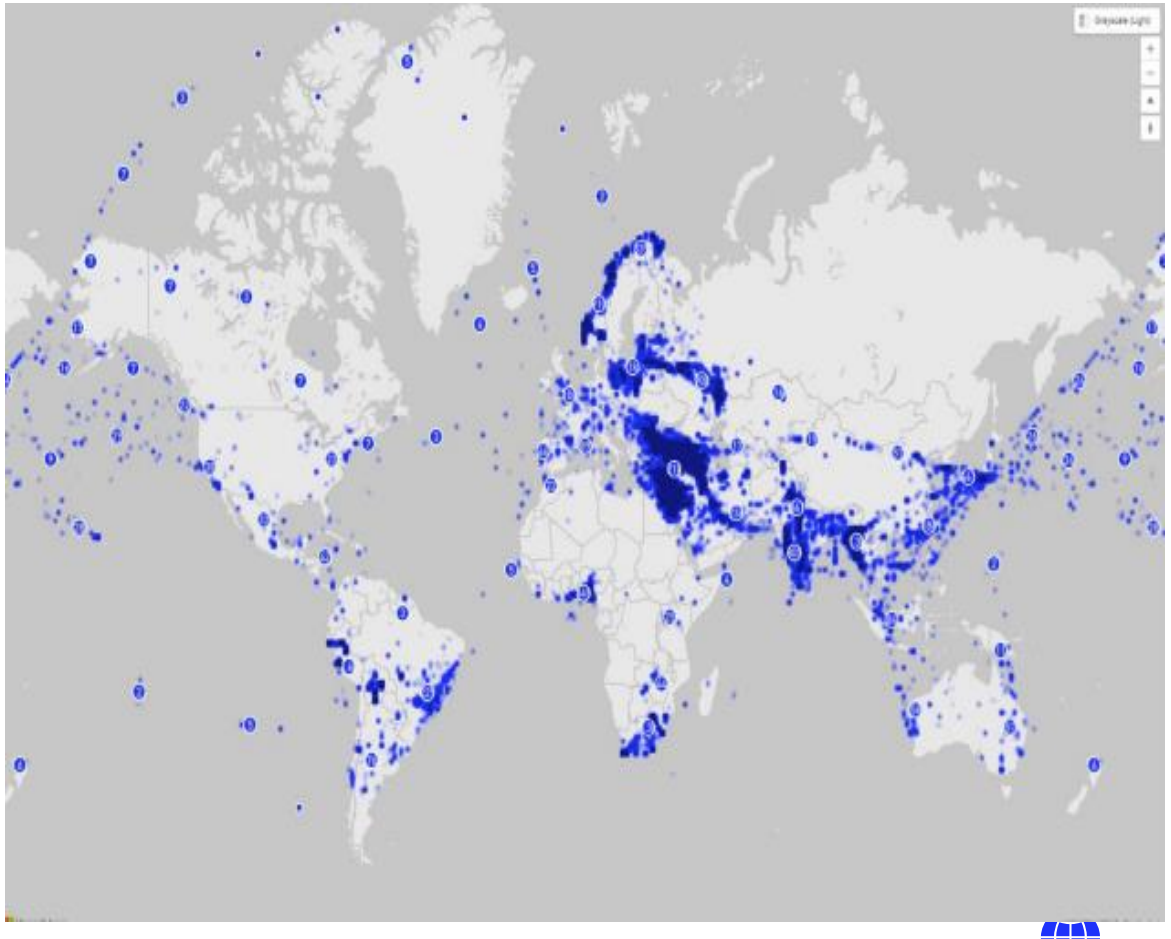


GNSS RFI Recorded events

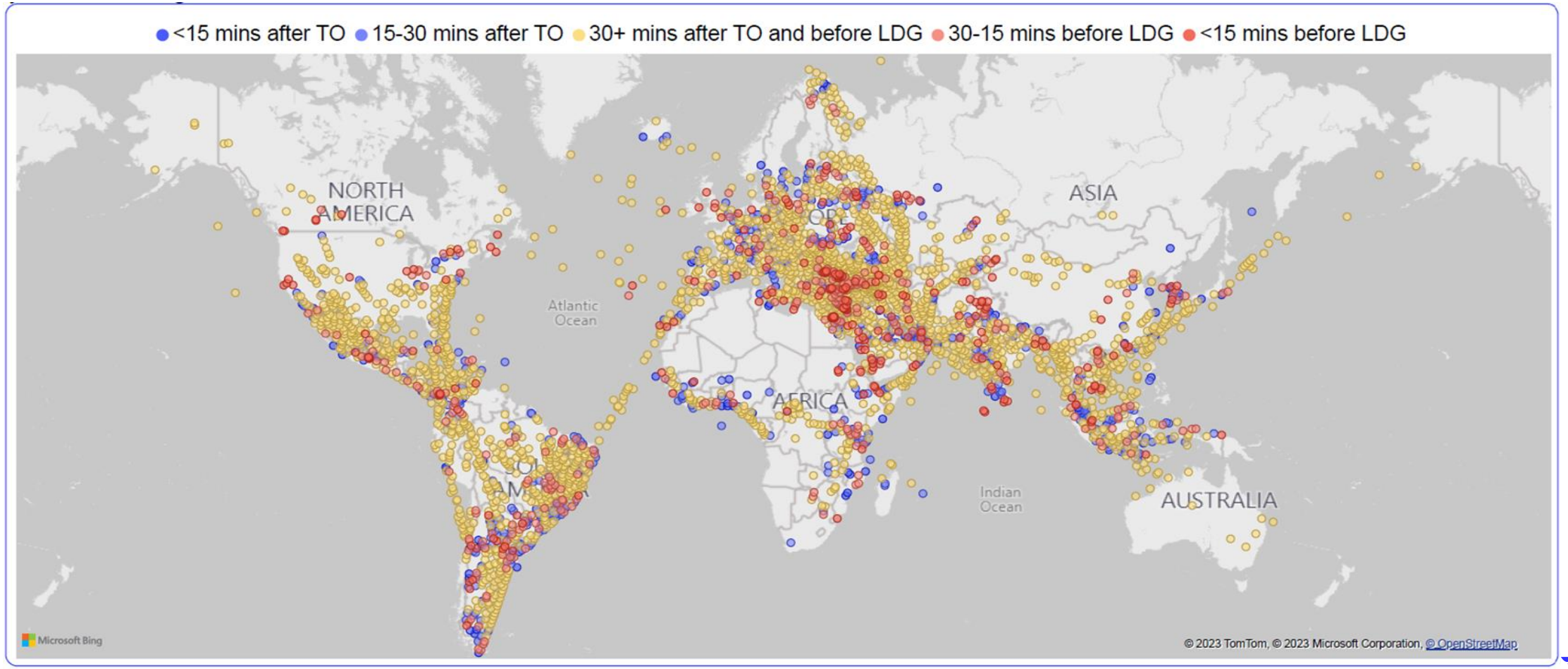
GNSS RFI Recorded events 2023



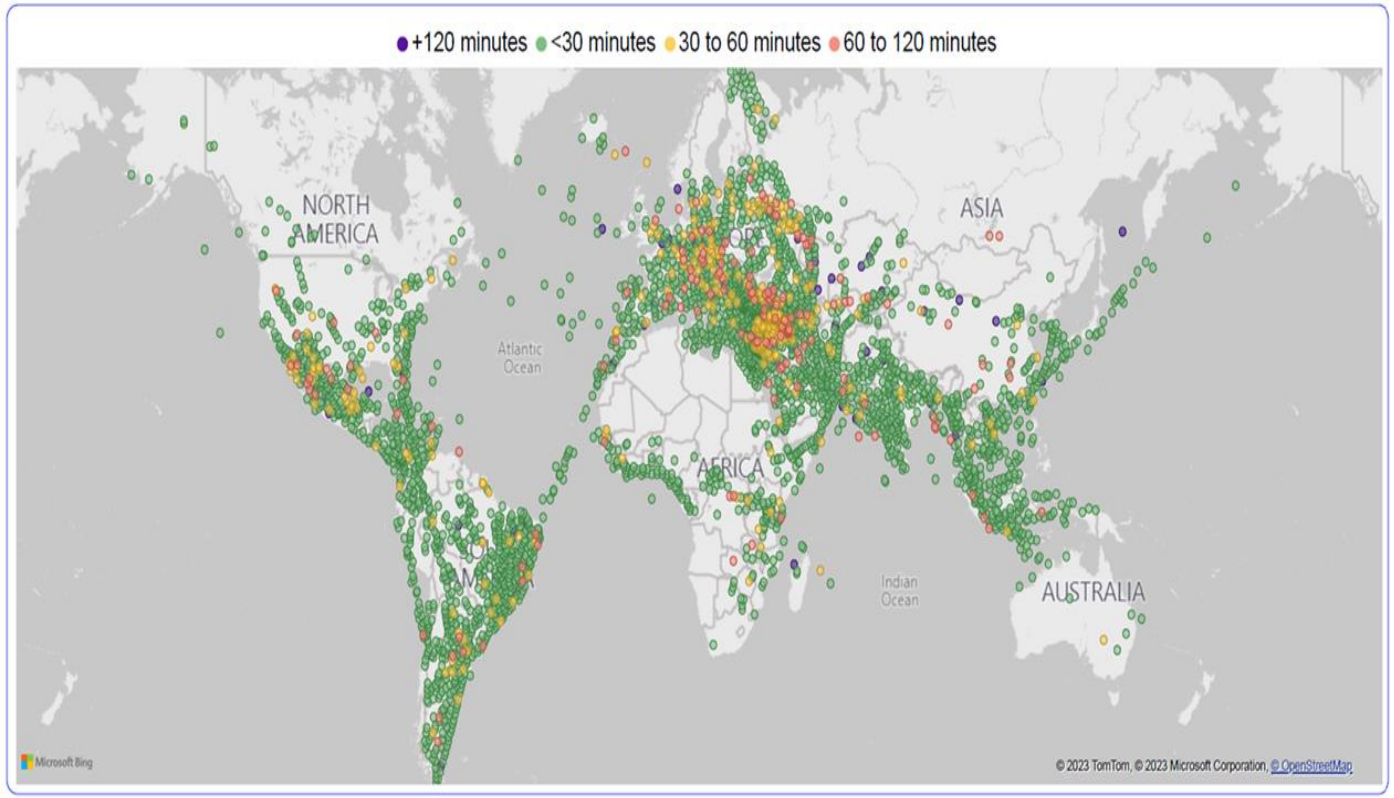
GNSS RFI Recorded Events (Jan-Jun 2024

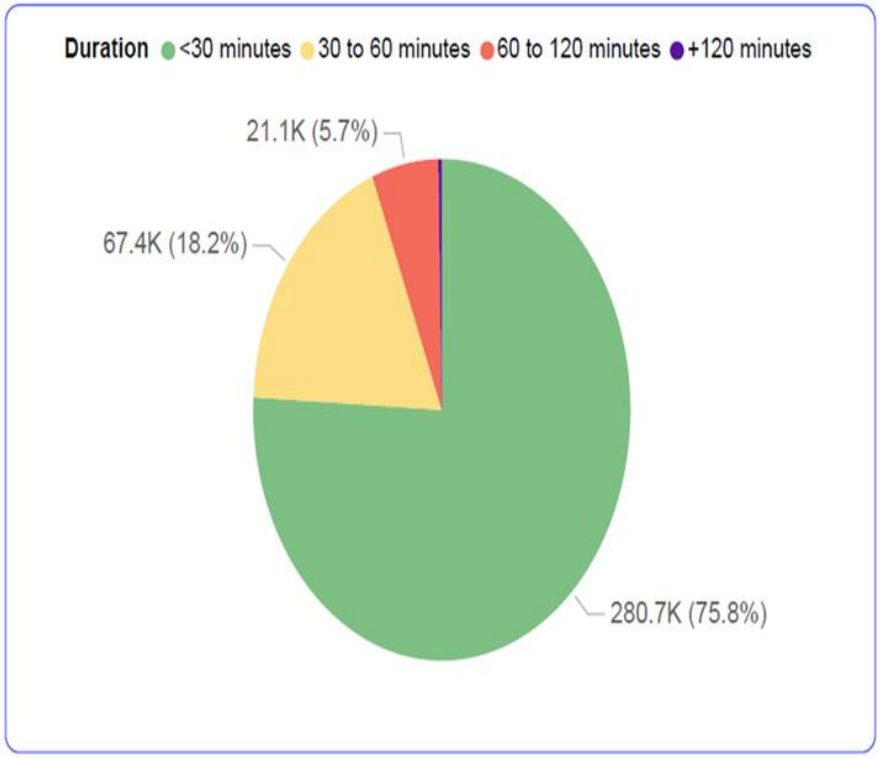


Signal Loss Occurrence Phase of Flight

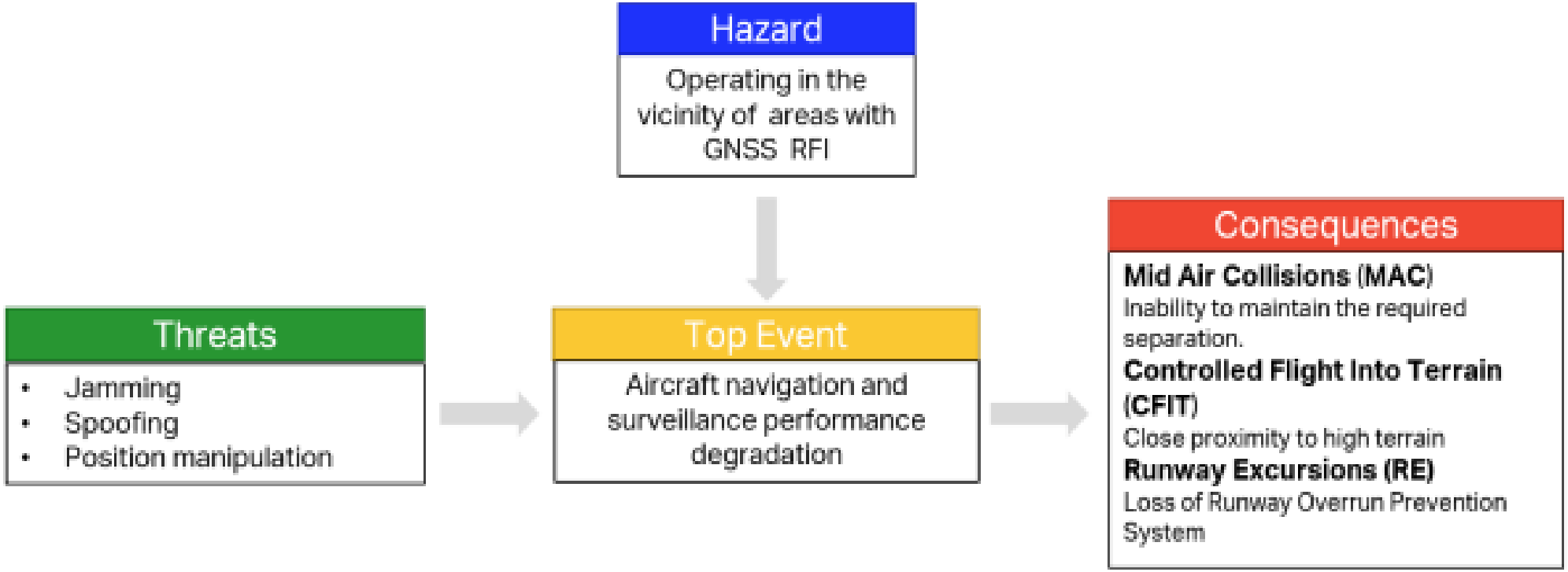


GPS Signal Loss Occurrence Duration





GNSS RFI – Safety Risk Model (SRA)



GNSS RFI - SRA

AIRLINES - Mitigation Measures

Consider using simulator training sessions to explore RFI-related CRM and crew mitigation.

Consider circulating aircrew notices, special crew briefings and supplementary procedures to enhance crew awareness of cockpit effects and required actions before, during and after GPS interference.

Stay in contact with aircraft and equipment manufacturers to receive guidance on operating aircraft and systems during interference and integrate their recommendations into standard procedures.

GNSS RFI – SRA (cont'd)

ANSPs - Mitigation Measures

Coordinate with state spectrum regulator to establish monitoring, notification and mitigation processes.

In coordination with airlines and other airspace users, periodically reassess the national CNS rationalization plan, ensuring minimum operating network (MON) for operational resilience.

Ensure that flights impacted by GNSS RFI are instructed (by NOTAM) to inform ATC so that ANSPs can plan route realignment and other mitigations for longer-term RFI issues.

GNSS RFI – SRA (cont'd)

The European Union Aviation Safety Agency (EASA) issued third revision of Safety Information Bulletin (SIB) 2022-02R3

The bulletin is addressing GNSS RFI including:

- ❑ FIRs affected by jamming and spoofing (updated on July 5, 2024).
- ❑ EASA Recommendations and mitigating measures for different stakeholders.

IATA FDX indicates it has become a safety risk in other geographical areas (FIRs):

- SAM Region
- MID-ASIA Region
- Africa Region

EASA SIB No.: 2022-02R3

EASA
European Union Aviation Safety Agency

Safety Information Bulletin
Operations – ATM/ANS – Airworthiness

SIB No.: 2022-02R3

Issued: 05 July 2024

Subject: **Global Navigation Satellite System Outage and Alterations Leading to Communication / Navigation / Surveillance Degradation**

Revision:
This SIB revises EASA SIB 2022-02R2 dated 06 November 2023.

Applicability:
Competent Authorities (CA), Air Traffic Management/Air Navigation Service Providers (ATM/ANS providers), air operators, aircraft and equipment manufacturers, organisations involved in the design or production of ATM/ANS equipment.

Description:
Since February 2022, there has been an increase in jamming and/or spoofing of Global Navigation Satellite Systems (GNSS). EASA has analysed recent data from the Network of Analysts and open sources and has concluded that GNSS jamming and/or spoofing has shown further increase in the severity of its impact, as well as an overall growth of intensity and sophistication of these events. This issue particularly affects the geographical areas surrounding conflict zones, but it is also encountered in the south and eastern Mediterranean, Black Sea, Middle East, Baltic Sea, and Arctic area.

The list of affected flight information (FIR) regions is published on the EASA website at https://www.easa.europa.eu/GNSS.

Recommended Procedure – Entering Risk Area

- **Entering Risk Area**
  - Check enroute FIR NOTAMs for any GPS spoofing advice
  - Cockpit Preparation: Perform full IRS alignment if entering known area with GPS spoofing risk
  - Be aware of typical sensor hierarchy for FMS position: GPS, then IRS, DME/DME, VOR/DME,
  - Consider de-selecting GPS sensor input if option available.
  - Review differences between GPS Jamming and GPS Spoofing.
  - Perform time check and set correct time on personal device or watch.
  - Crew to notify Air Traffic Control whenever GNSS RFI events are experienced and notify respective aircraft and avionic OEMs
- Airlines to develop procedures and training based upon information received from OEM & CAA.

Recommendation

- States
  - to report cases of GNSS radio frequency interference to ITU.
  - to ensure & maintain adequate DME Infrastructure and DME based PBN procedures
  - to maintain necessary MON of Nav Aids & secondary surveillance radar infrastructure. (including VOR, ILS Cat I/II/III and DME).
  - to facilitate or deploy as appropriate real-time monitoring and detection solutions for GNSS RFI,
  - issue NOTAMs on GNSS RFI events in a timely manner
  - to establish and ensure **appropriate frequency regulations are in place** and maintained to protect allocated GNSS frequencies from harmful interference.
  - to ensure **contingency /back up procedures** (conventional routes) are established in coordination with ANSPs and airspace users

NEXT STEPS

The GADM Team is currently working on a detailed study on GPS interference, which is anticipated to be completed and available by Q4 of this year.

Continue engagement with ICAO NSP and follow up on the AN-Conf recommended actions.

Continue working with the MID Region on an infrastructure rationalization plan to determine the optimum MON of conventional navigation aids.

Thank you.